

MINERAL SOLUBILITY

Purpose:

This activity will give students an opportunity to measure and calculate the solubility of several substances.

Concepts:

1. Different minerals differ in their tendency to dissolve in a given solution.
2. Solubility of a mineral can be measured and calculated.
3. Solubility of the host rock is important to repository performance.

Duration of Lesson:

One and one half 50-minute class periods

Objectives:

As a result of participation in the lesson entitled *Mineral Solubility*, the learner will be able to:

1. calculate the solubility of a mineral in water; and
2. apply his/her observations and conclusions to the significance of the solubility of minerals to the geologic repository.

Skills:

Calculating, drawing conclusions, hypothesizing, measuring, observing, recording data, working in groups

Vocabulary:

Anion, cation, ion, ionic solid, mineral, soluble, solubility

Materials:

Activity Sheets

Mineral Solubility, p. 195

Videotape

Science, Society, and America's Nuclear Waste Teleconference Series (available free of charge from the OCRWM National Information Center, 1-800-225-6972; within Washington, DC, 202-488-6720)

Other

Epsom salts ($\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$)
table salt (NaCl)
sodium bicarbonate (NaHCO_3) (Baking Soda)
plaster of Paris ($\text{CaSO}_4 \cdot 1/2 \text{H}_2\text{O}$)
eight (8) oven-safe glass containers (100 mL or larger)
funnel
filter paper
oven
balance (capable of weighing to 0.1 g)

Suggested Procedure:

1. This experiment is a bit more difficult than *Solubility*. Students will be required to take measurements carefully if they are to come up with reasonable results. If this activity is done before or without *Solubility*, it may be helpful to go over the Suggested Discussion Questions (1-6) presented with that activity as an introduction to the concept of solubility.
2. It might be helpful to review the purpose, necessary materials, and procedure for this activity with students before directing them to set up the experiment.
3. Have each group independently determine the volumes of water in which they will be dissolving minerals and discourage them from using 100 mL for each mineral. A constant volume of 100 mL would make solubility calculations in Step 10 of the procedure unnecessary.
4. It may be helpful to suggest to students that they choose the largest possible volumes of water in which to dissolve the sodium bicarbonate and the plaster of Paris since they are the least soluble of the four minerals. When dissolving the plaster students should be cautioned not to add too much powder. They may easily create a jar of “rock”. Smaller volumes of water will suffice for the table salt and the Epsom salts.
5. Have students complete the experiment. They should calculate solubilities and compare their calculated values to the known values (see answers). You may wish to list the known values on the board for comparison after students have completed their calculations.

Teacher Evaluation of Learner Performance:

Student participation in experiment/activity will indicate understanding.